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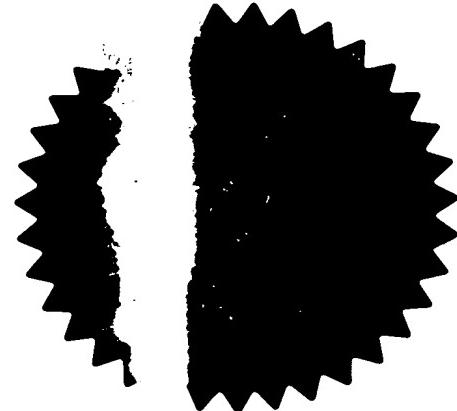
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Cardiff Road
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1. Your reference

SJW/6698

2. Patent application number

9912813.4

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3. Full name, address and postcode of the or of each applicant (*underline all surnames*)

Cerestar Holding B.V.
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Holland

Patents ADP number (*if you know it*)

576105 1002

Holland

4. Title of the invention

"Sugar-Free Hard Coatings Prepared from Liquid Mixtures of Erythritol and Sorbitol"

5. Name of your agent (*if you have one*)

Stevens Hewlett & Perkins
1 St. Augustine's Place
Bristol BS1 4UD
United Kingdom

"Address for service" in the United Kingdom to which all correspondence should be sent (*including the postcode*)

Patents ADP number (*if you know it*)

1545002

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| Country | Priority application number (<i>if you know it</i>) | Date of filing (<i>day / month / year</i>) |
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7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the earlier application

Number of earlier application

Date of filing
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Yes

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- b) there is an inventor who is not named as an applicant, or
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| | |
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| Description | 8 |
| Claim(s) | 1 |
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Translations of priority documents

Statement of inventorship and right
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(*Patents Form 10/77*)Any other documents
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11.

I/We request the grant of a patent on the basis of this application.

Signature *Stevens Hewlett & Perkins*

Date

02/06/99

STEVENS HEWLETT & PERKINS

12. Name and daytime telephone number of person to contact in the United Kingdom

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Sugar-free hard coatings prepared from liquid mixtures of erythritol and sorbitol

Technical field

The present invention relates to a sugar-free hard coating prepared from a coating syrup comprising a liquid mixture from sorbitol and erythritol. The present invention relates to sugar-free hard coatings giving good adhesion to cores consisting of edible, chewable or pharmaceutical components. The invention also relates to products coated with the said compositions. The coatings based on the compositions of the present invention show good crispiness and/or crunchiness.

Background of the invention

Conventional panning procedures to prepare hard coatings generally work with sucrose, but recent advances in panning have allowed the use of other carbohydrate materials to be used in the place of sucrose. Sucrose proves to be detrimental for teeth and causes dental caries due to easy formation of acids. Therefore coatings are nowadays increasingly made of sugar-free compositions.

US 4,127,677 describes a sugarless xylitol-coated chewing gum, which delivers an intense cooling effect and which has a pleasant smooth feel. However the cost of xylitol is quite high and partial replacement of xylitol in the coating would be an advantage. To obtain good hard coatings, fast even crystallisation must occur during application and drying.

WO 95/07625 describes the advantages of at least partial replacement of xylitol with erythritol in chewing gum coating. In a specific example erythritol and xylitol are used together in a single layer, since both polyols are co-crystallised. Preferably the xylitol portion of the solids in the solution should be about 40% to about 80% xylitol, with the solids in the solution comprising about 20% to about 60% erythritol. However, the hard coating peels easily from the gum core and it has a slight sandpaper finish. This example demonstrates that application of polyol mixtures in hard coatings is very sensitive to the ratio of the polyols and depends on the kind of polyol applied. The appearance of the coating may be affected by the crystallisation difficulties.

On the other hand sorbitol has been suggested as a substitute for sugar in sugarless preparations. However it has been indicated that sorbitol can be used as an ingredient of the core but difficulties might arise to apply sorbitol in hard coatings, due to its hygroscopic nature. The major drawback of the use of sorbitol is that the resulting coating layers do not show the same crunchiness and crispiness as the conventional sucrose-based coatings.

US 4,238,510 discloses a method for sorbitol coating wherein it is ensured that the sorbitol crystallises. By this method cycles are repeatedly carried out comprising a) application of a first coating syrup containing sorbitol, an adhesion or binder component and a film-forming agent, b) application of a dry dusting powder in the form of a mix comprising sorbitol in a powdered form, a moisture absorbing component, an anti-sticking component and a dispersing agent. It is believed that the crystalline powder acts as a seed crystal for the saturated sorbitol solution. However, the obtained result is not satisfactory since the coating layer is not evenly distributed, and rough surfaces are obtained, while the hard coating is not as crunchy as is obtained with normally employed sugars. US 4,423,086 describes that hard coatings based on sorbitol can be obtained when applying a coating syrup having a concentration of dry matter comprised between 60 to 85% by weight and the richness of the syrup in sorbitol being greater than 80%, preferably greater than 95%, and still more preferably greater than 99%. On the other hand the sorbitol based coatings are less expensive but lack the important cooling effect of the hard coatings based on xylitol which is giving the pleasant smooth feeling and which is especially desirable for the application of hard coatings of chewing gums. In this respect, sorbitol coatings are improved by the addition of other polyols, which have this important cooling effect. However US 5,536,511 mentions that it has been difficult in practice to use more than 5% sorbitol in a xylitol panning coating, and at these low levels, sorbitol acts as a crystallisation modifier. These coatings with limited amount of sorbitol lack the cost-effective advantage.

So far sorbitol based hard coatings contain either more than 80% sorbitol, preferably more than 99% sorbitol, or the hard coatings are based on mixtures of sorbitol with other polyols such as xylitol, but then the quantity of sorbitol is practically limited to 5%. EP 0813817 discloses a process for coating cores with mixtures of sorbitol and other polyols,

wherein the concentration of sorbitol is not limited to 5%. The applied process is different from the panning procedures which is applying solely liquid coating syrups and the sorbitol syrup is applied to a rotating mass of cores and then at least one other polyol is added in a crystalline form. Preferably the polyol is selected from the group consisting of Isomalt^r, xylitol, maltitol and erythritol. The crunchiness is at least comparable to that obtained with sucrose. However, the mentioned method requires the addition of the second polyol in crystalline form.

Accordingly, a need exists in the market place for a cheap sugarless coating prepared from liquid mixtures of polyols, resulting in a crunchy hard coating, which is well adhered to the gum base.

Summary of the invention

The present invention discloses a process for coating cores by applying a liquid coating syrup comprising a liquid mixture of sorbitol and erythritol. The present invention discloses coating syrups comprising a liquid mixture of sorbitol and erythritol, where the weight ratio of erythritol is between 1 to 50%, preferably between 5% to 50%, more preferably between 20% and 50%. Coating with these liquid mixtures of sorbitol and erythritol give smooth surfaces, and result in crunchy hard coatings, which adhere well to the gum base.

The sugar-free hard coatings of the present invention are applied to prepare hard-coated comestibles, which consists of a hard coating and an edible, chewable and/or pharmaceutical core. Preferably the sugar-free coatings of the present invention are used for coating pharmaceutical tablets, chewing gum, confectionery products (such as candies), chocolate and nuts.

The present invention discloses hard-coated comestibles, which are coated by applying the rotating panning process.

Brief description of the drawings

Figure 1 is a scanning electron microscope picture, with magnification of 250x, measured at 10 kV, of the cross-section of a gold-coated sample.

It shows the hard coating prepared from the liquid coating syrup of the mixture of 60% sorbitol and 40% erythritol.

It is clearly seen that the hard coating is very well adhered to the gum base.

Figure 2 is a scanning electron microscope picture, with magnification of 250x, measured at 10 kV, of the cross-section of a gold-coated sample.

It shows the hard coating prepared from the liquid coating syrup of the mixture of 40% xylitol and 60% erythritol.

It is clearly seen that the hard coating is less good adhered to the gum base.

Detailed description of the invention

The present invention discloses a process for coating cores by applying a liquid coating syrup comprising a liquid mixture of sorbitol and erythritol. The present invention discloses coating syrups comprising liquid mixtures of sorbitol and erythritol, where the weight ratio of erythritol is between 1 to 50%, preferably between 5% to 50%, more preferably between 20% and 50%, and giving rise to crunchy hard coatings with a uniform smooth surface with good adhesion to the core.

Sorbitol is defined as the hydrogenated product resulting from dextrose or glucose syrups, thus containing eventually limited amounts of other polyols such as maltitol.

Erythritol may be obtained by a fermentative process or it may also be obtained from a chemical process such as the conversion of dialdehyde starch, tartaric esters or tartaric acid, and it gives the same cooling effect as xylitol. Moreover erythritol does not contribute to dental caries, does not significantly contribute to calories and does not cause gastric distress like some other polyols. Moreover it has been discovered that hard coatings with erythritol do not pick up moisture from the atmosphere and hygroscopicity is reduced significantly.

The present invention discloses the preparation of hard-coated comestibles, which consists of a hard coating and an edible, chewable and/or pharmaceutical core and wherein the hard coating is adhered well to the core. At least one layer is prepared from the liquid mixture of sorbitol and erythritol to obtain the good adhesion to the core. The other layers may consist of single polyols. Preferably the sugar-free coatings of the

present invention are used for coating pharmaceutical tablets, chewing gum, confectionery products (such as candies), chocolate and nuts.

When the present invention is applied for hard coating of chewing gum, any conventional chewing gum centre (core) may be used. Preferably the centre is sugar-free and constitutes from about 35 to about 65% of the chewing gum product.

Coating syrups devoid of any binding or film forming agent, but consisting of liquid mixtures of sorbitol and erythritol whereby the weight ratio of sorbitol is lower than 50% give rise to rough irregular surfaces. The best results are obtained with liquid mixtures of sorbitol and erythritol, which are consisting of 40% erythritol and 60% sorbitol.

The composition of the coating syrup is not limited to the liquid mixture of sorbitol and erythritol, but it may contain additionally some other ingredients such as artificial sweeteners, dispersing agents, colouring agents, film formers, binding agents, and/or flavouring agents.

Liquid mixtures of sorbitol and erythritol wherein the weight ratio of sorbitol is lower than 50% may give rise to smooth regular surfaces when applying coating syrups which contain additional ingredients, such as binding agents, or film forming agents.

The coating syrup is initially present as a liquid syrup which contains from about 30% to 80% or 85% of the coating ingredients previously described herein, and from about 15% or 20% to about 70% of a solvent such as water.

In general, the hard coating process is carried out in a rotating pan. Cores to be coated are placed into the rotating pan to form a moving mass. The material or syrup, which will form the hard coating is applied or distributed over the cores and drying is performed with air. The drying air is in the temperature range of from about 15 to 45°C and a moisture content of at most 50% relative humidity is applied. Each component of the coating on the core may be applied in a single hard layer or in a plurality of hard layers. In general a plurality of layers is obtained by applying single coats, allowing the layers to dry, and then repeating the process. Any number of the coats may be applied to the core. Coatings of from 1 to 100 layers are easily obtained, preferably the number of layers is between 1 and 40. The optimal amount of layers will depend on the desired application and can be determined experimentally.

The effectiveness of the hard coating, prepared according to the present invention is compared to the hard coating prepared from a liquid coating syrup containing erythritol and xylitol. The hard coating prepared from the liquid mixture of sorbitol and erythritol is superior in quality, since the adhesion to the gum core is much better.

The present invention is illustrated by way of the following examples.

Example 1

Panning conditions

To prepare the liquid mixture of sorbitol/erythritol 60/40 (trial 1), 11.2 kg erythritol (C★Eridex 16952) were mixed with 16.8 kg sorbitol (C★Sorbidex P16616) and 12 kg water. The resulting mixture was stored at 60°C.

The coating was performed in a pilot Driacoater.

50 kg cores, whereby the weight of uncoated centres was 0.9 g each, were rotating at 8 rpm and 0.6 kg of coating syrup was applied each time. The drying step was carried out by blowing air in at the bottom of the drying pan at 24°C.

Further applied panning conditions are mentioned in Table 1.

Table 1

| Conditions | Phase 2 | Phase 3 | Phase 4 | Phase 5 | Phase 6 | Phase 7 | Phase 8 |
|-------------------|---------|---------|---------|---------|---------|---------|---------|
| Drying T(°C) | 24 | 24 | 24 | 24 | 24 | 24 | 24 |
| Total dosing (kg) | 4.2 | 0.6 | 0.6 | 21.6 | 2.4 | 0.3 | 0.0 |
| # kg/dosage | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.6 | 0.0 |
| Smoothing t (sec) | 25 | 60 | 25 | 60 | 240 | 300 | 300 |
| Drying t (sec) | 300 | 300 | 300 | 400 | 200 | 600 | 900 |

Figure 1 shows clearly that the hard coating is well adhered to the core.

Example 2

Liquid mixtures with other ratios of sorbitol/erythritol were prepared. About 40 kg of total liquid mixture were prepared and each time 50 kg cores, whereby the weight of uncoated centres was 0.9 g each, were rotated in a pilot Driacoater at 8 rpm.

The other applied panning conditions are mentioned in Table 1.

The composition of the liquid mixture of sorbitol (S) and erythritol (E) for the coating syrup, its storing temperature and the resulting properties of the hard coating are mentioned in Table 2.

The coating syrups were devoid of binding, dispersing or film forming agents and the resulting hard coatings were compared to the hard coating prepared in trial 1 (example 1).

Table 2

| Trial | Composition: ratio sorbitol(S)/ Erythritol (E) | Dry substance of coating syrup (%) | Temperature (°C) of coating solution | Physicochemical- Organoleptic Evaluation |
|-------|--|---------------------------------------|--|---|
| 2 | S/E 30/70 | 70 | 65 | Rough surface, powdery |
| 3 | S/E 40/60 | 70 | 65 | Rough surface |
| 1 | S/E 60/40 | 70 | 60 | Smooth transparent surface, crunchy coating, cooling effect |
| 4 | S/E 80/20 | 70 | 50 | Smooth transparent surface, crunchy coating, cooling effect |

Example 3

The liquid mixture of erythritol and xylitol were prepared from 11.2 kg xylitol and 16.8 kg erythritol, 2 kg gelatine (33%) and 11.2 kg water. Everything was mixed and stored at 65°C.

A pilot Driacoater was filled with 50 kg cores, whereby the weight of uncoated centres was 0.9 g each, and the liquid mixture was applied while rotating at 8 rpm.

Further applied panning conditions are mentioned in Table 3.

Table 3

| Conditions | Phase 2 | Phase 3 | Phase 4 | Phase 5 | Phase 6 | Phase 7 |
|-------------------|---------|---------|---------|---------|---------|---------|
| Drying T(°C) | 24 | 24 | 24 | 24 | 24 | 24 |
| Total dosing (kg) | 0.6 | 0.6 | 2.4 | 24 | 1.2 | 0.0 |
| # kg/dosage | 0.3 | 0.6 | 0.6 | 0.8 | 0.6 | 0.0 |
| Smoothing t (sec) | 45 | 45 | 30 | 20 | 20 | 500 |
| Drying t (sec) | 250 | 300 | 275 | 350 | 275 | 500 |

The obtained results are displayed in Table 4.

Table 4

| Trial | Mixture | Ratio | Temperature (°C) | Dry substance (%) | % gelatine | Evaluation |
|-------|---------|-------|---------------------|----------------------|-------------|--------------|
| 1 | S/E | 60/40 | 75 | 70 | No addition | Crunchy |
| 5 | X/E | 40/60 | 65 | 70 | 1% | Bad adhesion |

Figure 2 corresponds to the hard coating prepared in trial 5. It is clearly demonstrated that the hard coating is less good adhered to the core. This is in clear contrast to the good adhesion of the hard coating prepared according to trial 1, which is shown in figure 1.

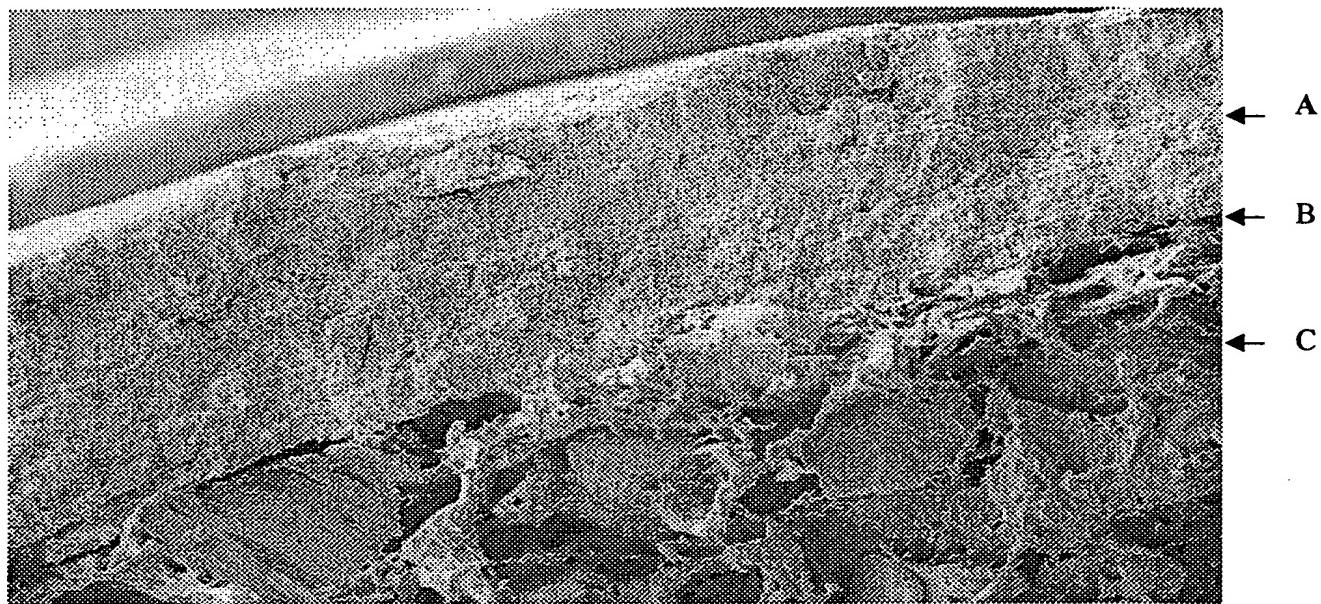
Claims

1. Sugar-free hard-coated comestibles consisting of a hard coating and an edible, chewable and/or pharmaceutical core characterised in that at least one layer of the hard coating is comprising a mixture of sorbitol and erythritol wherein the weight ratio of erythritol is between 1% to 50%.
2. Sugar-free hard-coated comestibles characterised in that the weight ratio of erythritol according to claim 1 is between 5% to 50%, preferably between 20% to 50%.
3. Sugar-free hard-coated comestibles according to claim 1 to 2 characterised in that the coating syrup comprises binding agents, dispersing agents, film formers, colouring agents, and/or flavouring agents.
4. Hard-coated comestibles according to claim 1 to 3 wherein the hard coating consists of 1 to 100 layers.
5. Hard-coated comestibles according to claim 1 wherein the core is selected from the group consisting of pharmaceutical tablets, chewing gum, confectionery product (such as candies), chocolate or nut.
6. A process for preparing hard-coated comestibles comprising the addition of a coating syrup to the moving mass of the cores in a rotating pan characterised in that the coating syrup is comprising a liquid mixture of sorbitol and erythritol wherein the weight ratio of erythritol is between 1% to 50%.
7. A process according to claim 6 wherein the application of the layers is repeated between 1 and 100 times.

Abstract

The present invention discloses a sugar-free hard coating prepared from a coating syrup comprising a liquid mixture from sorbitol and erythritol. Coating with liquid mixtures of sorbitol and erythritol gives a crunchy hard coating, which is well adhered to the gum base. The invention also relates to products coated with the said compositions.

Figure 1



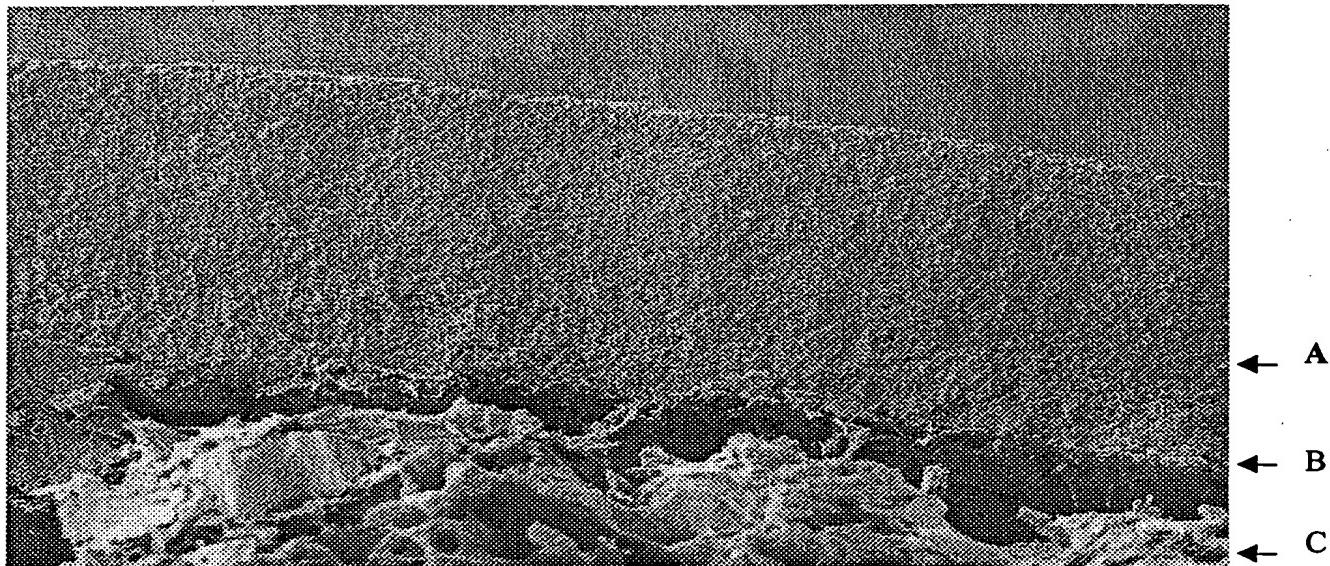
A = hard coating

B = adhesion of hard coating to core

C = core



Figure 2



A = hard coating

B = bad adhesion of hard coating to core

C = core

Application No: _____

Pillsbury Madison & Sutro

Inventor: P-A. E. DE MEUTER et al

Filed: 6/5/00 (CER-93)

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CL.#20436 M#270736